divisional application too, because nevertheless that the cylindrical cavity 40 (Figs.13-14) is known, **new system of microwave distribution in barrel-shaped cavity** (in detail descovered in divisional application and shown on Figs.15-16), would apply to cylindrical cavity 40 too, as a **primery embodyment** for all appliances claimed in issued patent No. 6,624,399.

Before, an applicant did not draw any ellipsoidal shapes neither in provisional, nor in utility application, only a spheroidal kind, because he was not completely confident of their patentability, **until** getting this Detailed Action. Nevertheless, everywhere in the texts and Figures of the previous applications, the words ellipsoid, ellipsoidal had been presented equally with the words sphere, spherical, ect. In geometry, **sphere** is the only particular case out of the general series of ellipsoids, when two of its main axes are equal.

2. The claims 1-18 and 20 are listed in this response.

3. An applicant used all the statements within parentheses and underlining with the only aim to help the Examiner better and quicker understand the climing system during an introductory period. Now, all statements are eliminated.

4. Fig.17 has been cancelled by an applicant as a new matter.

5. Claims 25 and 28 listed in the previous response have been deleted from the list as a new matter. In present response an applicant remade copletely claiming system.

6. An applicant regards and points out his invention as the following.

There was invented a new shape of countertop microwave oven, based on a shape of ellipsoid with the flat bottom. At a particular case, a geometrical form - an ellipsoid can acquire a spheroidal shape, simply speaking - sphere, when its both vertical and horizontal axes are equal. Just on the base of most simple, spheroidal shape, new microwave oven was firstly depicted in both applications (provisional and utility).

However, in general, there are a great plurality of possible shapes of ellipsoids, where ratios of their horizontal to vertical axes can be highly different. But practically, only those shapes can be the most suitable for countertop microwave ovens, where their axes' ratios fall between 1.0 and 2.0. The ratio 1.0 would correspond to the pure sphere, while 2.0 - would to the 'flattened down' sphere - ellipsoid. If we would need have the oven's heating cavity tall, we choose sphere, as its design basis, if we need an enough wide (roomy) cavity, we would choose an ellipsoid, where its diameter (horizontal axis) would be approximately twice as big as vertical (height) one. Many different oven shapes could be possible with axis ratios within 1.0 and 2.0.

The outer shape of new microwave oven is not only a caprice of aestheticism. First of all, the oval shape gives us the unique economy in material used, because oval shapes, if compared to

rectangular ones, have the **minimum surface-to-volume ratio**. Moreover, outer (body) and inner (cavity) shells can be made with a pretty small thicknesses, because spherical or elliptical shells are the most rigid for a given thickness, if to compare them to box shells, of which conventional ovens have been made.

Elliptical shells are much rigider than cylindrical ones because of a **two-directional shell's curvature**, whereas the cylinder has only an one-directional curvature. So, two-directionally curved spherical or ellipsoidal shells possess their **highest self-rigidity**, without need of any additional supporting longerons, or any stampings, as it occurs in conventional, box-shaped ovens, to rigid their cavities' walls.

Yet, oval microwave ovens would possess a highly elegant, streamline appearance, never seen before. Their cleaning, both from outside and inside, would be very convenient and easy, because of a totally streamline and smooth surface. Also, micriwave ovens, based on ellipsoidal shapes, take up minimum place on a kitchen counter, especially at corners. They belong to the so-called space saving cooking appliances.

An applicant considers this shape as a revolutionary. Just new-invented ellipsoidal shape had directed the inventor to invent new shape for heating cavity - the very effective **barrel-shaped** one, which, in its turn, opened the direct way for a radically new and effective microwave distribution in the cavity - **non-uniform distribution** (below).

So, these three main matters - oven's outer ellipsoidal shell and oven's inner, cavity's barrel-shaped sidewall shell along with the new non-uniform distribution, based on this barrel-shaped cavity, are highly interconnected, represent the main essence of invention and cannot be considered separately.

An inventor believes, that the ellipsoidal kind of oven will inevitably represent a new generation in the area of countertop microwave appliances.

7. Among claims, numerated in previous response, 26, 27, 28, 29, 30 and 31, the 28-th has been deleted as a new matter. The rest - an applicant has remade and renumerated them.

8. An applicant believes that titles could be as following:

a) Ellipsoidal microwave oven;
b) Ellipsoidal countertop microwave oven (applicant's preference);
c) Ellipsoidal countertop microwave oven with non-uniform microwave distribution;
d) Ellipsoidal [countertop] microwave oven with barrel-shaped cavity;
e) Others, at Examiner's discretion.

9. Generally, an applicant understands this quotation, but this is a very subtle matter.

10. The Examiner finds that Knight's oven (GB 2 266 039) can be considered as having a

substantially ellipsoidal shape. In fact, Knight's oven has been construed from two forms - pure cylinder, as a main central part (claim 8) and mostly flat cap with rounded edges (see Figs.1, 2 and 3, details 2, 3 and 4). This is not an ellipsoid. Even not an ellipsoidal shape. Applicant's oven is based completely on a mathematically **pure**-ellipsoidal shape where the only exception is offcut lower part. An ellipsoidal shape is very similar copy to applicant's pure-sphere-based oven shown on Figs.5, 6 and 15-16. The only difference between spherical and ellipsoidal ovens would be their diameter/height ratio: an ellipsoidal oven would have it about 1.5-2.0, whereas sphere-based-oven ratio would be about 1.2, if to exclude the offcut of lower part. Full sphere's ratio is equal 1.0.

All Knight oven's views (top, side and section) definitely show no similarity neither to spherical, nor to ellipsoidal shapes. Further, Knight's control panel is placed on the bottom ledge, whereas applicant's - on the smoothly ellipsoidal (spherical) front top. Knight's machine compartment is behind the cavity, applicant's one - on the top. Knight's back side of the oven is flat, applicant's one - smoothly oval. Knight's oven's door is cylindrical, applicant's one is oval. Knight's cavity is cylindrical (claim 12), applicant's one - radically new - **barrel-shaped**. Microwave supply (openning) is placed on side wall, whereas applicant's one - centrally on the ceiling.

Knight's system of microwave distribution in the cavity - conventional, with uniform microwave density throughout the cavity, applicant's one is radically new - a non-uniform distribution. Very possibly, this new systen of microwave distribution in the cavity might be a breakthrough.

Knight's housing engineering design affects down oven's weight and structural characteristics, because of its partially cylindrical partially flat shells (top and back), which are made of metal sheets with excessive thicknesses. Applicant's housing design would be much more lightweight, because of housing's spherical or ellipsoidal shells, which are formed of the two-directional-curvature shells and therefore would keep enough high rigidity at smaller shell's thicknesses, if compared to Knight's cylinder and flat shells, which are one-directional curved, or not curved at all (back oven's side, for example).

So, new oven's basic outer shapes - sphere or ellipsoid - play big **utility** role, not only aesthetical one. These important oval oven's utility features were enough described (with more datas, please see them) still in the provisional application No. 60/279,292, filed March 28, 2001.

11. Claims 25, 26 and 28 are eliminated. The essence of claim 27 is clarified and redone in claims 29 and 30 of new editing of claiming (see below). Now, about Claesson (4,816,632) and You (5,880,442) patents.

First of all, Claesson oven's cavity is classically box-shaped, not barrel-shaped as applicant's one. Secondly, two streight and short ridges on rectangular bottom have no similarity to applicant's **series of ring grooves** with saw-formed profile (not round profiled, as Claesson's). Further. Objects are similar, but functionally, Claesson's two streight short ridges and applicant's series of ring grooves play differently (please compare Claesson's Figs. 1, 2, **3** and applicant's Fig.**15**-16). Claesson's ridge function is described in column 4, lines 11-17, 33-37 and 57-60. Applicant's

grooves' function is described in claims 27-29 and in the text. Absolutely different functions: Claesson tries to achieve a heating uniformity, while an applicant tries contrary - non-uniformity in microwave distribution.

You's patent 5,880,442 is more modern and a bit more close to applicant's concept. You is right in his column 1, lines 66-67 and column 2, lines 1-25, which fully support applicant's concept. However, applicant went far ahead, conceiving a **barrel**-shaped sidewall with grooved bottom at most simple system of power source - single, center-placed on cavity's top, opening. Moreover, applicant's non-uniform microwave distribution possibly can change the general direction in microwave oven industry.

But first of all, let's see the concrete similarities and differencies. Similarities: You's **ring** steps vs. applicant's **ring** groves; **centrally** placed microwave openings. Perhaps, that's all. Now differences: **box**-shaped vs. **barrel**-shaped cavities; **big ring-shaped steps** on both bottom and ceiling vs. **flat** ceiling with **tiny grooves** on **flat** bottom; two centrally placed **stirring fans** vs. **no fans** at all;

Now, a short analysis of those similarities and differences. According to You's summary, his object is to provide such an oven' cavity which would disperse the microwaves with a maximum electromagnetic field intensity. Applicant's object partially is same. But You makes maximum this intensity not as effectively as applicant does, because You's cavity generally is box-shaped and only remotely can remind an applicant's far more progressive very simple and technically more elegant - a barrel-shaped cavity versus his using the bulky ring-shaped steps on bottom and ceiling. Furthermore, You makes his intensity uniformly throughout the cavity (the use of two stiring fans is the proof), while an applicant does it more effectively inventing a non-uniform microwave dispersing, with a maximum intensity only where the food is placed. And therefore, the stiring fans is a nonsense.

So, all those differences between You and applicant tell that applicant went farther of a You's prior art, and the discovered similarities show that applicant's concepts are on right way.

12. Chang's cylindrical and spherical shapes (3,691,338) have very remote relation to applicant's heating cavities - cylindrical and spherical, because patterns of microwave distribution inside the cavities, as well as quontities of microwave generators (plurality) and their locations and their designs (very complicated and obsolite (1972) dipole antennas) represent absolutely different matters. For example, what common can be between Chang's spherical **cavity** and applicant's spherical oven's **outer shell**? Functionally, they are absolutely different things, though by shape they are similar. Applican's cavities - cylinder and barrel - both have **single** power source placed on top of cavity, whereas Chang's ones have a plurality of them (6 and 8) placed on top, on bottom, on sides. Their patterns of microwave distribution **maybe** (!) have some very special applications in avia industry, but they have nothing to do with modern countertop microwave ovens. By applicant's mind, Chang's cavities represent only abstract, bare idea, never used.

Applicant does not pretend on spherical heating cavity, only on spherical oven's outer shell. This

is a novelty. Applicant pretends on barrel-shaped cavity. This is a novelty again. Applicant never pretended on cylindrical cavity, only on new system of microwave distribution in cylinder cavity, as well as in barrel-shaped cavity - non-uniform system of distribution, never filed before. Only You (5,880,442) can stand most close to applicant ideas, but applicant's cavitities designs and distribution system are far more modern.

Claims 1-18 and 20, filed Aug. 21, 2003, are currently cancelled by an applicant.

Claim 19, filed Aug. 21, 2003, is currently amended.

Claims 32-44 are added as the new claims.

What is currently claimed is:

Claims 1-18 (cancelled)

Claim 20 (cancelled)

19. (currently amended) [A space saving cooking appliance comprising a partially spherical outer shell with a flat bottom containing a partially spherical cooking space, said spherical cooking space also having a flat bottom parallel to said flat bottom of a said outer shell]

An ellipsoidal microwave oven comprising:

an oval outer shell 14;

a microwave cavity with an oval sidewall 44, flat top 13 and flat bottom 11A and 11B;

a machine compartment located above microwave cavity with antenna 420 located at the center of said flat top 13;

microwaves emitted spherically from antenna 420 on sidewall 44, on flat bottoms 11A and 11B;

a front oval door 34 for inserting and removing food;

32. (new) The ellipsoidal macrowave oven of claim **19** wherein a shape of said oval outer shell 14 is based on a form of ellipsoid.

33. (new) The ellipsoidal macrowave oven of claim **32** wherein said ellipsoid is formed by rotation of an ellipse around its vertical axis; said ellipse is built on two axes, horizontal and vertical, where their ratio is within 1.0 and approximately 2.0.

34. (new) The ellipsoidal microwave oven of claim **19** wherein said ellipsoid has a flat horizontal bottom; said horizontal bottom is located above lower point of said ellipsoid for approximately 20 percent of its height.

35. (new) The ellipsoidal microwave oven of claim **19** wherein said oval sidewall 44 has a shape of a barrel to reflect microwaves, emitted spherically from antenna 420.

36. (new) The ellipsoidal microwave oven of claim **35** wherein the said barrel is formed by revolving a curve 44 around vertical axis of said ellipsoid.

37. (new) The ellipsoidal microwave oven of claim **36** wherein said curve 44 is build on points **a-b-c-d-e** found as the reflective points to reflect said microwaves radially from said barrel-shaped sidewall 44 downward onto said bottom 11A, where food mostly remains underheated.

38. (new) The ellipsoidal microwave oven of claim **37** wherein said corrugated part 11B has a series round grooves to reflect radially microwaves from said round grooves to the central lower part of cavity to enhance cooking power in said part of the cavity.

39. (new) The ellipsoidal microwave oven of claim **38** wherein the center-bound slopes of said round grooves 11B are leant under different angles: the slopes of most centrally placed rings are more steep while the most outer ones are more slopping in order to converge reflected from said round grooves microwaves into the most low zone of the cavity.

40. (new) The ellipsoidal microwave oven of claim **19** wherein said microwaves, radially emitted from a single antenna 420 on three different zones - on said oval sidewallwall 44 (**a-b-c-d-e** zone), on said bottom 11A (**f** zone) and on most central part of said bottom 11A (**g-h-i-h-g** zone), create a non-uniform microwave density throughout the cavity, concentrating said density in most needed spots and keeping it thin where it is not needed.

41. (new) The ellipsoidal microwave oven of claim **40** wherein said microwave density is most high (except antenna's emission zone) over said bottom 11A (**g-h-i-h-g** zone), where all three flows of said microwaves - directly emitted from said antenna 420, reflected from said oval sidewall 44 and reflected from said round grooves 11B - have been finally come together,

creating the most dense microwave zone to be able to penetrate and heat most deep portions of food.

42. (new) The ellipsoidal microwave oven of claim **19** wherein a shape of the said oval door 34 for inserting and removing food complies with the general shape of said microwave oven's ellipsoid, including door's window glass and microwave shield.

43. (new) The ellipsoidal microwave oven of claim **42** wherein said front door 34 opens and closes in an up-and-down manner without a handle; said front door opens up automatically by pressing a button on control panel, and closes pushing the door down by hand.

44. (new) The ellipsoidal microwave oven of claims **19** wherein said front door 34 is windowless.

Once again about applicant's an non-uniform distribution concept

In conventional box-like cavities, standing microwaves create a chaotic pattern of a coarse-scale microwave uniformity throughout the cavity but whith numerous relatively small-scale cold and hot spots, i.e. with thin and thick microwave densities. To overcome this small-scale non-uniformity, or ununiform density, it was invented long ago a turntable to continually change the locations of those small hot and cold spots. However, this system is not effective, because food is under relatively low heat power and threrefore heats up slowly.

An applicant went by radically different way - he invented such a cavity which creates a large-scale **non**-uniformity, concentrating high microwave density (and heat power) only in **needed** locations and leaving it low in unnecessary locations. This is clearly seen on Fig.15, where all standing microwave rays finally get the lower center part of cavity, where the food usually places.

As to the problem with small-scale cold and hot spots in applicant's designs, the high concentration of all microwave rays in relatively small space - just immediately over the center part of bottom - would exclude all those unwanted cold spots, turning them into hot ones and therefore sharply decreasing the cooking time.

In the lower center part of cavity, where food usually places, the microwave density, i.e. heat power, is most high and food heats up much quicker. This can be possible only with a vertically symmetrical cavity and with special shapes of cavity's sidewall and bottom. This is the second essence of the invention. The first essence of it is the weight economy due to the highly effective outer shell form - ellipsoid, and sphere as a particular case of ellipsoids.

The matters (claims 42, 43, 44) about the door which opens and closes in an up-and-down manner and its window are not newcomers. They are discribed in provisional applications.

An applicant supplies this corrected response with three preliminary views (plan, front and side views) of *ellipsoidal* microwave oven with a door opening in an up-and-down manner (claim **43**) in order to give the Examiner a more precise understanding of the difference between spherical and ellipsoidal kinds of shapes. Axis ratio (horizontal/vertical) employed in this case is about 1.2, just within 1.0 and 2.0, according to claim **33.** If the Examiner accepts generally these views, an applicant will make about four additional Figures, showing plan, front, side views and vertical section.

Respectfully submitted

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